DIVISION OF ENTOMOLOGY

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HAWAIIAN SUGAR PLANTERS' ASSOCIATION

Leaf-Hoppers and their Natural Enemies

(PT. V. FORFICULIDAE, SYRPHIDAE, AND HEMEROBIIDAE)

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HONOLULU, H. T.

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LETTER OF TRANSMITTAL.

Honolulu, T. H., October 23, 1905.

To the Committee on Experiment Station, H. S. P. A., Honolulu, T. H.

Gentlemen:—I, herewith, submit for publication the fifth part of the Bulletin on "Leaf-Hoppers and Their Natural Enemies."

This part has been prepared by Mr. F. W. Terry, Assistant Entomologist of this Division ,and deals with some of the predaceous enemies of leaf-hoppers.

Yours obediently,

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GENERAL REMARKS ON EARWIGS.

The Forficulidae or Earwigs are as a group very easily distinguished from any other families of the Orthoptera, but much diversity of opinion appears to exist as to their true affinities. Many authors still consider them a distinct order, Dermaptera or Euplexoptera; but the most general acceptation appears to be that they are merely a somewhat aberrant family of the Orthoptera. Their distribution throughout the world is very general, some species having a very wide range, owing no doubt to their secretive habits and facility of transportation. The warmer regions of the globe appear to be much more productive of species than the temperate zones. The total number of species recorded appears to be slightly over 500, these being included in 52 genera. Although practically omnivorous, the vegetarian habits of some of the Forficulidae are well known, and owing to the predilection of the common European species (*Forficula auricularia*) for the foliage of Dahlias and other favorite garden plants, this insect is very unpopular with the careful horticulturist.

Instances of damages to so important a crop as hops, are also recorded, but such cases appear to be rare. Several observations on their insectivorous diet are also recorded, the forceps being used to hold the unfortunate victim, whilst it is devoured at leisure. The economic value of *F. auricularia* in destroying the larvae and pupae of the Tortricid moth, *Cochylis ambiguella* (so destructive to grape vines in Europe) has also been observed, and also the destruction of other injurious insects. In New South Wales and Queensland, a small earwig, *Spongiphora* sp. (?) was observed in great numbers in the cane-fields, feeding upon leaf-hoppers and other insects, by Messrs. Perkins and Koebele. The maternal solicitude exhibited by the female for her eggs and newly hatched young has been recorded by numerous observers. Much diversity of opinion has been expressed by observers as to the use of the forceps; they have been observed to aid in the folding and unfolding of the wings, and in the raising of the tegmina preparatory to flight. From personal observation we know that they are important aids to feeding, de-

fense, aggression, and titillation on the part of the male preparatory to copulation. One S. American species (*Sphingolabis linearis*) is stated to cause much annoyance and painful wounds with its forceps, "leaving double puncture marks on the skin."

But few parasites have been observed or recorded; Lucas obtained a yellow parasitic worm, which he suggests is a Nemathelminthid (*Mermis* sp.), from a specimen of *Forficula auricularia*, the abdomen of which was much swollen. Two Tachinids are recorded; Rodzianko stating that *Roeselia antiqua* was bred from an East European species, *Forficula tomis*, and Fischer records another fly, *Tachina setipennis* from *Forficula* sp.

Of the eight species known to be established on these islands, the five following have been observed in the cane fields:

1. *Anisolabis annulipes*, Lucas. Common generally.
2. *Labia pygidiata*, Dube. Common locally.
3. *Labia sp.* Not common.
4. *Labidura sp.* Not common.
5. *Chelisoches morio*, Fab. Common in the wet districts.

Of these *Chelisoches morio* and *Anisolabis annulipes* are of considerable economic inportance and have therefore been particularly studied.

CHELISOCHES MORIO.

(1) General Remarks.

Of the species in these islands, this fine Forficulid is certainly the most important economically. It has a wide distribution in the islands of the Pacific Ocean, and is recorded from Tahiti, Fiji, Hawaii, New Guinea, Java, Sumatra, Celebes, Philippines, Batchian, India and Ceylon.

It is an extremely active species, especially during the larval period, and appears to be diurnal, running over the leaves in search of insect food during the hottest part of the day. The adults will readily take to flight, the unfolding of the wings being a very rapid process and quite independent of the forceps, the writer never having seen them used either to assist in the folding or unfolding process. Wet localities seem to suit it best, since it abounds in the moist mountain ridges and valleys, and

also in many of the elevated and wetter plantations. It is scarce in the dry and irrigated cane areas. Its predatory habits on leaf-hopper have been observed by several people. Young hoppers are seized and devoured without the aid of the forceps, but these organs frequently assist in holding an adult hopper whilst it is eaten at leisure. An examination of numerous crops invariably revealed only insect remains, often entirely leaf-hopper. Those bred in captivity showed during all instars a marked preference for insect diet.

(2) The abdominal plates.

The much-discussed fused dorsal, and missing ventral abdominal plates, are well represented in the female of this species The (presumably) 8th and 9th tergites are very narrow (still more so in *Anisolabis annulipes*) and fused on to the large 10th. The (presumably) 8th and 9th sternites are much reduced; the 8th is almost entirely membranous except for the anterior chitinized angles; the 9th still remains chitinized laterally, these areas forming thin laminae; the 10th consists of a pair of strongly chitinized plates, each with an inner articulation to permit defaecation. In *Anisolabis annulipes* these ventral plates (except the 10th) appear to have entirely disappeared (Pl. IX, fig. 5.)

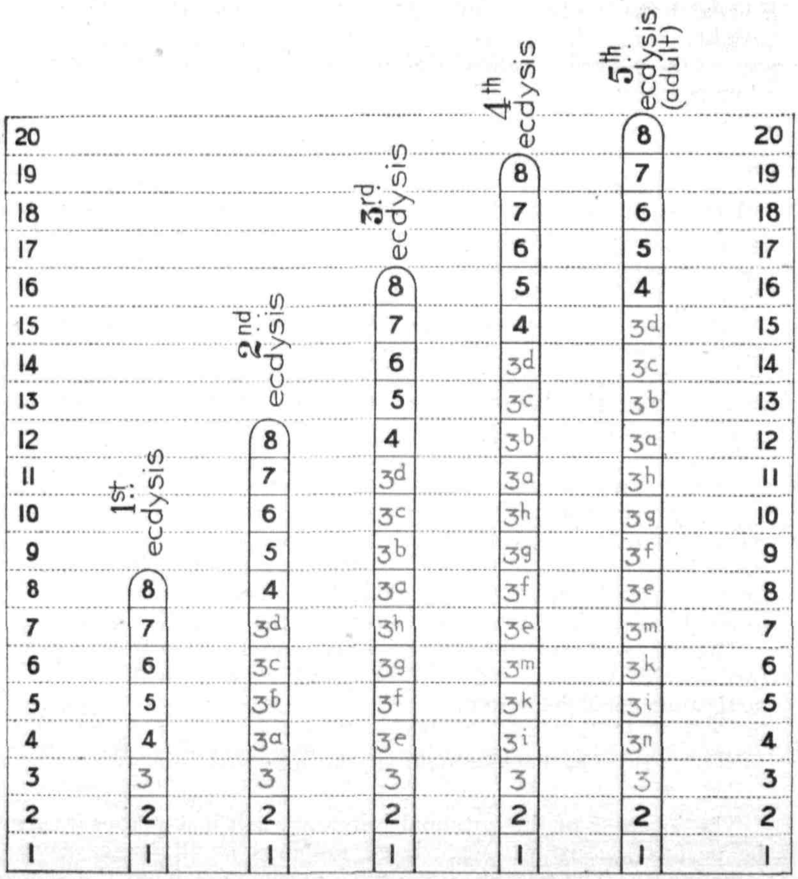
In the male *Chelisoches*, only the 10th sternite is discernable, represented by a pair of strongly chitinized plates. There appears to be no trace of the 8th and 9th sternites the whole membranous area being extremely delicate. The 8th and 9th tergites are normally developed and not fused. Pl. IX, fig. 6.

There is still one sternite to be accounted for in both sexes (presumably the 1st). No trace of its early fusion with the metasternum could be found.

(3) The development of the antennal joints.

The increase of the antennal joints at each instar appears to be perfectly constant, since large numbers in all stages were examined. The additions at each ecdysis arise from the segmentation of joint 3. Upon hatching the antenna consists of eight joints; at the first ecdysis this number is increased to twelve, the additional four arising from joint 3, thus the 4th joint becomes the 8th. At the second ecdysis the additional

four again arise from joint 3, the previous four being thus pushed forward, the original 4th joint now becomes the 12th. At the third ecdysis only three additional joints are gained, and at the fourth (last) only one, so that the original 4th now becomes the 16th.



It is possible that the adult insect sometimes possesses more than twenty joints, but that appears to be the maximum, out of a large series that were examined.

(4) Description of all stages from egg to adult.

The Egg.

The eggs are deposited in a heap usually in the leaf sheaths of various large-leaved succulent plants such as *Canna* and sugar-cane, and are placed sufficiently far down to afford ample protection from the sun or enemies, the mother keeping continuous guard during the incubation period and for several days after the hatching of the young. She is most assiduous in her attentions to her ova, removing them carefully with the mandibles and palpi and constantly rearranging the batch. This maternal solicitude has been frequently observed in various species of earwigs and other insects; not infrequently however if disturbed, she will devour the entire lot. These batches consist of from about 40 to 60 eggs, the average number being about 45. Upon deposition, they are of an ivory whiteness and broadly oval, measuring about 1 mm. x 0.75 mm. (Pl. VIII, fig. 1.) As development proceeds and the surrounding moisture is absorbed, the elastic egg-membrane allows a very considerable increase in size to occur during the next few days. So that on the 5th or 6th day, (i. e.,) just previous to hatching) they are fully twice their original bulk, measuring 1.50 mm. x 1 mm. At this stage the embryo can be distinctly discerned in ovo, the abdomen being curved forward so that the forceps lie against the ventral surface. (Pl. VIII, fig. 2.) No trace of segmentation in the forceps of the embryo can be detected in this species.

First Larval Instar.

The larvae emerge about the 6th day and are at first of a pale ivory white; pigmentation rapidly develops, the eyes, head, apical antennal joints and femora assume a pale bluish grey coloration, which rapidly darkens and extends over those portions of the body surface which are destined to become black. At this instar the dimensions are as follows:

Antennae 2.50 mm.
Head and body 3-3.50 mm.
Forceps 1 mm.

The general facies even at the 1st instar is remarkably like that of the adult—this is still more apparent in *Anisolabis*—the chief difference apart from the absence of tegmina and wings,

being the relatively larger head, smaller forceps and the reduced antennal segmentation; head broadly cordate, dark brown, eyes black, antennae with eight joints, sparsely covered with short stout hairs, and 2nd joint short, one-fourth the length of the 3rd, which is the longest, 4th to 8th about equal, terminal joint conical, brown, the basal joints yellow, gradually darkening, the apical dark brown. Pronotum subquadrate, narrower than head, angles rounded, testaceous, posterior margin being slightly emarginate. Mesonotum quadrate, equal in width and length to the pronotum, angles rounded, testaceous, with a median pale infuscate transverse band which extends to the episterna. Metanotum posteriorly slightly wider than the preceeding and shorter, distinctly emarginate, yellowish brown. Abdomen, campodeiform, dorsal segments ten, the 1st visible; ventral segments eight, no trace of 9th and 10th visible, testaceous, the sides with dark brown bands, widening and darkening antero-posteriorly and uniting at about the 7th segment. Forceps slender, nearly straight, no trace of segmentation, bases testaceous, reddening apically ,with stout hairs sparsely distributed. Legs stout, testaceous, basal halves of the femora smoky brown, tarsus 3-jointed, second joint very short with a distinct lobe which is about one-third the length of the 3rd joint.
Plate VIII fig. 3.

Second Larval Instar.

At about the 6th day (after hatching) the 1st ecdysis occurs. The dimensions at this instar are as follows:

Antennae 4 mm.
Head and body 5-6 mm.
Forceps 1.25 mm.

The general facies is very similar to that of the previous instar; the chief change being seen in the additional joints of the antennae. The following variations from the previous instar are to be observed: As regards the darkened areas, these are much darker. Head blackish brown. Antennae with twelve joints the additional four arising between the 3rd and 4th joints from the segmentation of joint 3; the basal even testaceous; the newly formed 4th to 7th shorter than those succeeding them; 8th and 9th dark brown, 10th (sometimes 9th or none) whitish; 11th and 12th very dark brown, terminal conical. Pronotum quadrate, as wide as head, yellow testaceous. Mesonotum, blackish brown, except the posterior margin, which is testa-

ceous. Metanotum, more emarginate, testaceous with lateral infuscation. Abdomen, 1st segment testaceous, the rest uniformly blackish brown, ten segments dorsally, only eight visible ventrally. Forceps, more curved apically, a few rudimentary teeth present along the basal inner edge, castaneous. Legs, basal halves of the femora blackish brown; lobe of the 2nd tarsal joint similar to the previous instar. (Plate VIII fig. 4.)

Third Larval Instar.

At about the 17th day the 2nd ecydsis occurs. The dimensions at this instar are as follows:

Antennae 6 mm.
Head and body 7-8 mm.
Forceps 2 mm.

The general facies still resembles that of the very young larva. The dark brown areas of the previous instar have now become black, or nearly so.

The following changes are to be observed: Head black. Antennae, with sixteen joints, the additional four arising between the 3rd and 4th joints, again being produced from segment 3; the basal three testaceous, the newly formed 4th to 7th joints shorter than those succeeding them, (thus resembling their predecessors in the previous instar,) dark testaceous, the rest black except usually the 12th and 13th (sometimes only one of these), whitish. Pronotum black. Mesonotum black, slightly wider than the pronotum. Metanotum, rather wider posteriorly than the mesonotum, black, except along the posterior emargination, which is whitish testaceous. Abdomen,—first dorsal segment partially hidden by the rudimentary wing lobes, darkly infuscate, the rest black. Forceps, dark castaneous, several minute teeth present along the basal inner edge, the curvature similar to that of the previous instar. Legs,—basal halves of the femora blackish, the apical halves and the tibiae, infuscate; lobe of the 2nd tarsal joint about half the length of the third joint. (Plate VIII fig. 5.)

Fourth Larval Instar.

At about the 30th day the 3rd ecdysis occurs: The dimensions at this instar are:

Antennae 10 mm.
Head and body 12-13 mm.
Forceps, 4-4.25 mm.

The general facies now more closely resembles that of the adult.

The following are the principal variations from the previous instar:

Head, intense black. Antennae with nineteen joints, the additional three have again arisen from segment 3, but this is not so apparent as in the earlier instars, owing to the excessive pigmentation; the shorter form of the extra ones however, is still traceable. The entire antenna black, except usually the 14th and 15th joints, whitish, but this colour is extremely variable at this stage ranging from the 12th to the 16th joint. The antennae often vary in this respect in the same individual and not infrequently the white only occurs on a portion of a joint. Pronotum quadrate, anterior angles square, the posterior rounded, intense black, posterior margin whitish. Mesonotum intense black, distinctly wider than pronotum, the undeveloped tegmina distinctly visible beneath the metanotal plates. Metanotum somewhat broader than mesonotum, posterior edge deeply emarginate, caused by the immature wings which are now distinctly visible beneath, forming a pair of well-developed metanotal plates. Metanotum, intense black, except for a whitish semilunar area on the inner margin of each lobe. Abdomen, ten dorsal segments, the 1st entirely hidden by the metanotal plates, (this segment has already become somewhat dechitinized,) the rest black; the 2nd segment is also partially covered by the metanotal plates. Forceps, similar in form to the previous instar, several minute teeth present along the inner margins, black. Legs,—femora relatively longer than in the previous instar, basal halves black, apical halves and tibiae darkly infuscate, tarsi testaceous, lobe of 2nd tarsal joint more than half the length of the 3rd joint. (Plate VIII, fig. 6.)

The Adult.

The last ecdysis occurs at about the 50th day and some 4 days elapse before the final black coloration is attained.

The adults vary very considerably in size; the following being the range of dimensions observed:

	Males.	females.
Antennae	11 mm.	11 mm.
Head and body	12-17 mm.	13-18 mm.
Forceps	4-7.25 mm.	4-7 mm.

Besides the very considerable increase in size, a very decided change is visible structurally, the tegmina have become much longer and are freely articulate at their bases; beneath them are the true flight-wings which are large and membranous. The forceps have also assumed a relatively greater development.

Head shining black; antennae with at least twenty joints, black, except usually the 13th and 14th joints ,which are whitish or pale testaceous (the distribution of these pale joints is extremely variable even on the same individual); the three basal segments semi-glabrous, the rest pubescent, the basal considerably the largest and much thickened, the 2nd very short, the 3rd-5th shortish, the rest increasingly longer and slender. Pronotum broader than head, shining black, anterior margin straight, angulate; the posterior margin rounded. Tegmina long, shining black, sometimes with an aeneous reflection, in the male reaching nearly to 2nd abdominal segment, in the female somewhat shorter. Wings large, when folded in the male reaching nearly to the 3rd abdominal segment; in the female somewhat less.

Abdomen flattened, finely granulated, shining black, sometimes with an aeneous reflection; in the male ten dorsal segments, the posterior segment large, hind margin straight, tuberculated and folded, impressed in the middle, eight visible ventrally; in the female ten dorsal segments (8th and 9th very narrow and fused to the 10th), the posterior segment large, (less square than that of the male), posterior margin straight, tuberculated and folded, impressed in the middle; six segments visible ventrally, (the hidden 7th and 8th membranous. Folds of scent-glands on 4th segment distinct. Forceps long, flattened, in the male larger and more strongly incurved than those of the female, the inner margin irregularly crenulate, with a jagged dilation and a prominent bifid tooth basally. (Another form occurs on these islands in which the basal dilation is reduced, and distinct teeth extend two-thirds of the entire length; in the female the incurvature is less pronounced, the inner margin is crenulate and devoid of teeth. Pygidium more prominent in female than male. Legs, black, stout, tarsi yellowish, lobe of 2nd tarsal joint nearly two-thirds the length of the 3rd joint. (Plate IX fig. 1 and 2.)

ANISOLABIS ANNULIPES ,Luc. (Pl. IX fig. 3.)

This inconspicuous earwig has a wide distribution both in tropical and temperate zones.

Like the more conspicuous *Chelisoches morio*, it is omnivorous, but prefers insect food, often feeding almost exclusively on the cane leaf-hopper, as an examination of several crops has proved. It is nocturnal, remaining hidden down in the leaf sheaths or under trash and stones where the female may often be found zealously guarding her eggs. This species is interesting structurally since it is one of the most completely apterous forms of the family.

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HEMEROBIIDAE.

(*Chrysopinae.*)

The predaceous habits of the peculiar larvae of the Lace-wing flies are familiar to many. They feed chiefly upon Aphidae (plant-lice,) but various other injurious insects fall a prey to their voracity. The soft-bodied larvae of many species amply protect themselves by carrying various material and the general debris of their victims upon their backs, the dried skins, etc., of the latter being carefully packed between and upon the stout curved bristles of the lace-wing larva. The bodies of these larvae are usually much distended at about their middle, becoming rapidly attenuated posteriorly. The head is broad and depressed; the mandibles long and sickle-shaped. There is no true mouth, the fluids of the victims being sucked up through a groove which extends along each mandible.

The following four species of lace-wings have been observed in the cane-fields, feeding upon Aphidae and young leaf-hoppers. The first three are native species. The larvae of *Anomalochrysa* are often brilliantly colored, for example green with pink or crimson markings, and do not carry foreign matter upon their backs. The most beneficial and generally distributed species is *Chrysopa microphya*, a more detailed account of which is given below.

Anomalochrysa deceptor, Perk.

HAB. Oahu, Maui and Hawaii, but so far only found in the cane-fields on the latter island.

Anomalochrysa raphidioides, Perk.

HAB. Hawaii, found in the cane fields of that island.

Anomaiochrysa gayi? Perk.

HAB. Hawaii, found in the cane-fields of that island.

Chrysopa microphya, McLachl.

HAB. All the islands and in all cane-fields.

GENERAL REMARKS ON *CHRYSOPA MICROPHYA*, McLachl.

This small lace-wing fly is probably an introduced species but has undoubtedly been established on these islands for many years.

The stalked eggs are usually laid upon the under surface of a leaf or upon a branch, generally singly, sometimes in groups of 3 or 4. The larva upon hatching remains for a short time resting upon the empty egg. As soon as it leaves the egg-stalk it seeks eagerly for small particles of dirt, exuviae, etc, to place upon its back; should an Aphis or young hopper be encountered during the search, it is seized and after being sucked dry, the empty skin is placed upon the young larva's back. Those bred in captivity became full-fed in about 15 days, the adults emerging about 10 days later. The larvae are most voracious feeders and besides attacking young cane-leaf-hoppers have been observed to thrust their long mandibles into the imbedded hopper-eggs and suck them.

The oviposition has been described as follows: the female having selected a suitable locality, presses the tip of the protruded abdomen upon the leaf surface and exudes a viscid fluid (probably of a similar nature to silk) and then raises the abdomen, drawing out the viscous deposit into a thread, still attached to the abdomen; having proceeded thus, the egg is then extruded and attached to the extremity of this thread or egg-stalk.

The egg is oval, length about .75 mm., bright green, becoming yellowish as development proceeds; it is borne upon an extremely delicate hair-like stalk, 4-5 mm. in length.

The adult larva is about 5 mm. long. Head, across the eyes broader than long, depressed, pale greenish-testaceous, with four pairs of blackish longitudinal bands, the median pair one-third the length of the head, starting from the inner bases of the mandibles, convergent posteriorly; the extra-median pair broader, and extending from the mandibular bases to the back of the head, convergent posteriorly; the lateral pair narrow, and extending from the back of the eyes to the back of the head, the extra-lateral pair short and extending posteriorly from the sides of the eyes, this band is divided just behind the eyes, uniting shortly after. Eyes prominent, black. Mandibles, sickle-shaped, longer than the head, widely remote at their bases, testaceous, ferruginous apically.

The thoracic segments distinct from abdominal. Prothorax, broader than the head ,widening anteroposteriorly, bearing anterolaterally a pair of tubercles with radiating recurved bristles. Mesothorax, much broader than prothorax, the narrow constricted portion in front appearing to belong to the former, width more than twice the length, bearing antero-laterally a pair of tubercles bearing radiating recurved bristles. Metathorax, broader than the mesothorax. Width more than three times that of the length, bearing laterally a pair of tubercles with radiating recurved bristles. Legs moderate, whitish-testaceous.

Abdomen napiform, seven-segmented, each segment with a pair of lateral tubercles bearing bristles.

The general body coloring is pale greenish-testaceous with paired and irregular mottling of brown, the thoracic tubercles are whitish-testaceous and much larger than those of the abdomen, the latter being of the general body coloring, pale greenish-testaceous.

Pupa case nearly globular, about 2 mm. long, formed of closely-spun whitish silk, and usually covered with insect remains, etc.

Unfortunately the pupa of this beneficial insect is attacked by an Ichneumonid parasite, which at certain times and places becomes quite numerous.

The adult Lace-wing has been described by McLachlan as follows:

"*Chrysopa microphya*, n. sp."

"Body yellowish testaceous ("bright green" in life.) Head polished; palpi, antennae, and legs concolorous with the body; basal joint of antennae strongly bulbose; claws dilated internally at the base.

Abdomen apparently having a blackish band on either side, in which are yellow (or greenish) spots; clothed with rather long, but not dense hairs.. In the male it is terminated by a broad oval superior plate, concave beneath, and ventrally by a much shorter nearly semicircular plate.

Wings vitreous, slightly iridescent, ovate, subobtuse; neuration strong, open; longitudinal nercures greenish, transverse and graduate nercules mostly blackish, the costal nercules pale at either end, the whole set with rather long black hairs; pterostigmatic region elongate (very long and somewhat dilated in posterior wings of male), greenish; subcosta becoming con-

fluent with the costa before the apex; partition nervule of the third cubital cell extending beyond the nervule above it (the cellule oval); six and eight nervules in the two gradate series in the anterior wings of the male, and four and five (or six) in those of the female (in the pair before me;) fifteen to seventeen antepterostigmatic nervules.

Length of body 6 millim; expanse, male 20 millim., female 22 millim.

One of the smallest species and, in some respects, aberrant, the condition of the subcosta showing analogy with *Hypochrysa*, and the formation of the apex of the abdomen with *Anomalochrysa*; but as there are only two series of gradute nervules it cannot be located in the latter genus."

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SYRPHIDAE.

The economic value of the larvae of certain members of this Dipterous family are well known ,their aphidivorous habits making them of great benefit in destroying vast numbers of plant-lice. The larvae of one of the following species of *Baccha* were found in considerable numbers, feeding upon young leaf-hoppers in Queensland.

Baccha siphanticida, sp. nov.

Male: face retreating around epistoma, antennal prominence and frontal tubercle moderate but well defined, shining black, with whitish pubescence and greyish hairs on the sides of the frontal tubercle and epistoma; vertical triangle shining black; back of head whitish with greyish ciliation; antennae dull yellow, 3rd joint broadly oval, about as long as deep, arista bare, apically dark, pale at the base. Thorax and scutellum shining, aeneous, sparsely covered with short dark hairs and very finely punctate; scutellum fringed with brownish hairs, meso- and sternopleura with sparse testaceous pubescence and hairs, golden aeneous.

Abdomen, two and one half times the length of the thorax, the general facies spatulate, blackish brown, shining, destitute of marking, the specimen appearing somewhat immature. Second segment cylindrical and very slender; 3rd segment rather shorter and of the same width basally, but rapidly widening apically; 4th segment long, widest at its middle; 5th segment very short, narrowing considerably at its apex, hairs brownish, quite long, especially at the base. Legs testaceous, coxae and trochanters infuscate, the distal halves of the hind femora (except the knees) and tibiae infuscate. Wings hyaline, iridescent, subcostal cell infuscate, a faint transverse infuscation across the dividing point of the 2nd and 3rd longitudinal veins, and extending to the lower cross vein, also a faint transverse infuscation at the apices of the marginal and submarginal cells, with a central nonfuscate oval spot within this area. Alulae large, squamae pale yellow. Halteres yellow. Length 8.25 mm.; wing expanse 14.75 mm.

Female: face retreating as in male, steely, greyish hairs with whitish pubescence extending to sides of epistoma. Vertex steely, destitute of pubescence, with dark hairs. Frons with dark hairs and laterally a narrow band of whitish pubescence; antennal prominence and central tubercle destitute of pubescence; on the outside base of the antenna in one female, is a sub-semi-lunar purplish-violet area, the other specimen showing no trace of this; back of head more densely pubescent than in the male; antennae similar to male, 3rd joint rather less broadly ovate. Thorax and pleura blackish-aeneous or steely, scutellum aeneous fringed with grayish hairs, the mesonotum and scutellum finely punctate and clothed with short, whitish suberect hairs, with darker hairs on front of thorax. Meso-and sternopleura with dense whitish tomentum and hairs, mesopleura with a whitish yellow spot on its posterior margin. Abdomen; the general facies similar to that of the male but rather stouter, about three times as long as the thorax, black or steely and finely punctate, with numerous hairs distributed over the surface, these hairs are dark dorsally, whitish and more abundant laterally, and at the base are very long; at the base of the 4th segment are a pair of lateral sub-scalene-triangular, pale yellow patches, clothed with whitish hairs. Wings hyaline, with the following infuscation: The basal, costal and 2nd costal cells, the sub-costal cell (very dark), the basal half and apex of the marginal cell, the extreme base and apex of the sub-marginal cell, the middle of the upper basal cell, the bases and apical and

middle of the middle and lower basal cells, the bases of the 2nd and 3rd posterior cells and the wing base. Alulae and squamae as in the male, halteres orange, legs similar to the male but owing to the greater maturity, brighter yellow, and the infuscation blackish. Length 11:75; expanse 19 mm.

HAB. Queensland, Cairns and Kuranda, (Koebele 2250) The larvae were observed in abundance around Cairns by Messrs. Koebele and Perkins, and were found to be feeding upon larvae and nymphs of Poecilopterine Fulgorids of the genus *Siphanta.* Many of the puparia were observed to be parasitized by a Chalcid. On one occasion great numbers of the adults were seen in one locality, hovering at a considerable height above the ground.

The following is a brief description of the puparium: Pyriform bulbous anteriorly, attenuated posteriorly, coriaceous, at the posterior extremity a respiratory tube, about one-fifth of the length of the puparium ,with a very short apical bifurcation, upon which opens the paired stigmata. General coloration dirty brown and blackish, with pale ill-defined bands arising in pairs from the median dorsal area. Length, 5 mm. length of tube 1 mm. Respiratory tube testaceous.

Baccha monobia, sp. nov.

Male: This species closely resembles the preceeding; the chief difference being that of color. Antennal prominence more pronounced than in the male of *B. siphanticida*, with a similar, but more vivid purplish-violet patch than that of the female of that species; antennae, dark orange. Thorax and scutellum, purplish-aeneous, with golden reflection anteriorly, clothed with short brownish hairs, scutellum fringed with dark hairs; sides of pronotum, the meso-and sternopleuron golden aeneous, with orange pubescence and hairs, pteropleuron brilliant golden with purplish marginal reflection. Abdomen, three times the length of the thorax, purplish-black, without markings, with whitish hairs, very long on the sides at base. Wings infuscate, iridescent, with still darker infuscation distributed as in the female of *B. siphanticida*.. Alulae large. Legs, brownish, coxae and trochanters blackish, hind femora and tibiae darkly infuscate, knees paler. Length 9.50; expanse 17 mm.

HAB. Kuranda, Queensland; one male taken whilst hovering around a *Siphanta* colony.

PARTIAL BIOLOGICAL BIBLIOGRAPHY OF *BACCHA*.

1 Osten Sacken, Baron "Entomologische Notizen," Stettin. Ent. Zeit. XXIII, 412 (1862.)
Refers to earlier records of habits of *Baccha*-spp., especially Coccidivorous forms.

2 Williston, S. W. "Synopsis of the North American Syrphidae," Bull. U. S. Mus. 31 : 269-83 (1886.)
Larvae aphidophagous, provided with well-developed hooklets.

3 Verrall, G. H. "British Flies" VIII, 455-9 (1901.)
Larvae feed on Aphidae or Coccidae.

DESCRIPTION OF PLATES.

Plate VIII.

1. Eggs of *Chelisoches morio.*
2. Embryo of the same in ovo.
3. Larva of the same 1st instar.
4. The same 2nd instar.
5. The same 3rd instar.
6. The same 4th instar.

Plate IX.

1. Adult female of *C. morio.*
2. Adult male of *C. morio.*
3. Adult female of *Anisolabis annulipes.*
4. Adult male forceps of the same.
5. Ventral surface of the distal portion of the abdomen of the female of *C. morio.* The large ventral plate (sternite 7) has been removed. *a*, cut edge of the 7th sternite; *b*; chitinized anterior angle of the 8th sternite; *e*, anus; *f*, articular portion of the 10th sternite; (the articulation allows the free passage of foecal matter; *g*, 10th sternite; *h*, 10th tergite; *i*, thinly chitinized plate of the 9th sternite; *k*, 9th tergite; *l*, 8th tergite; *m*, 7th abdominal stigma; *n*, genital aperture.
6. Ventral surface of the distal portion of the abdomen of a male of *C. morio.* The terminal ventral plate (sternite 9) has been removed.

a, penis (in situ); *b*, 10th tergite; *c*, 10th sternite; *d*, anus.

Plate. X.

1. Egg and newly hatched larva of *Chrysopa microphya*, McLachl.
2. Adult larva of the same.
3. Cocoon with the pupal skin of the same.
4. Adult female of the same.
5. *Baccha siphanticida*, (female.)
6. Puparium of the same.
7. Spiracular tube of the same, (much enlarged.)
8. Side view of the head of the same.

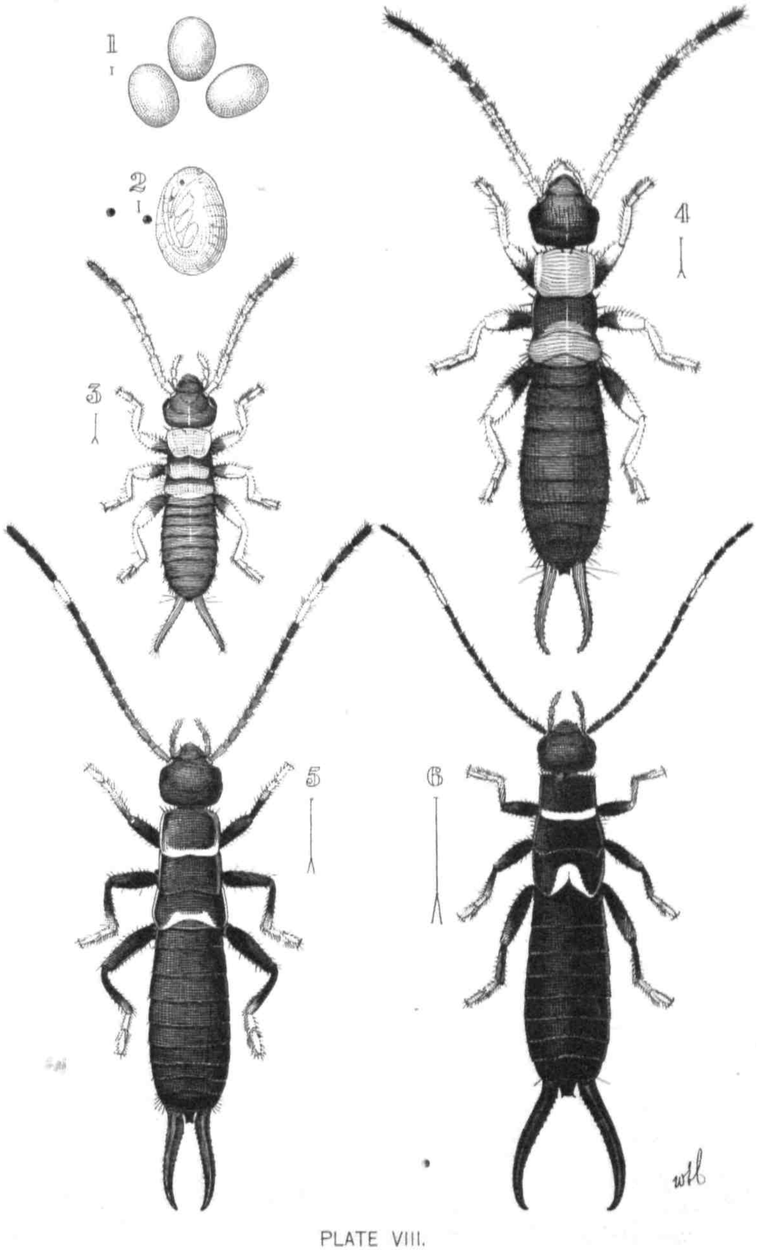

PLATE VIII.

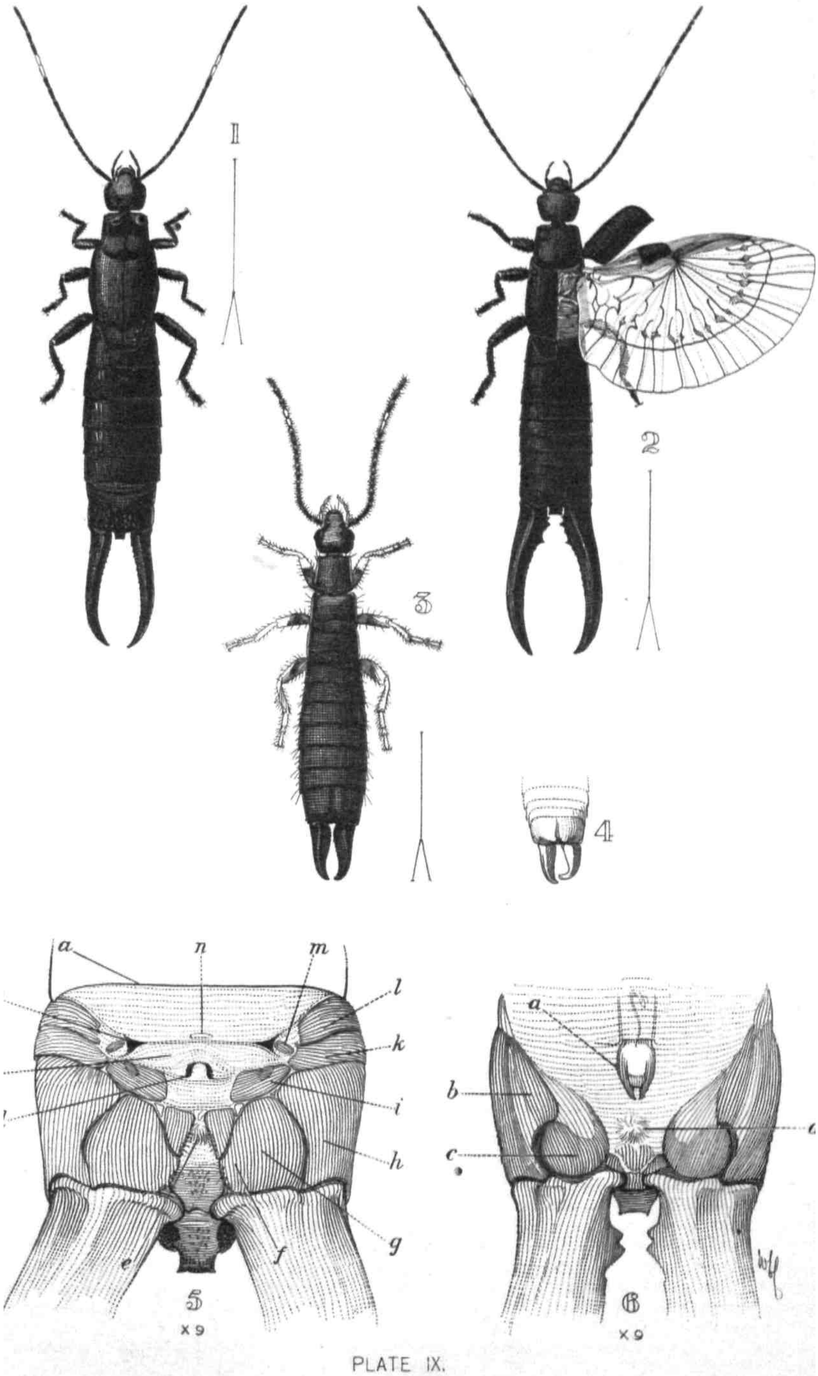

PLATE IX.

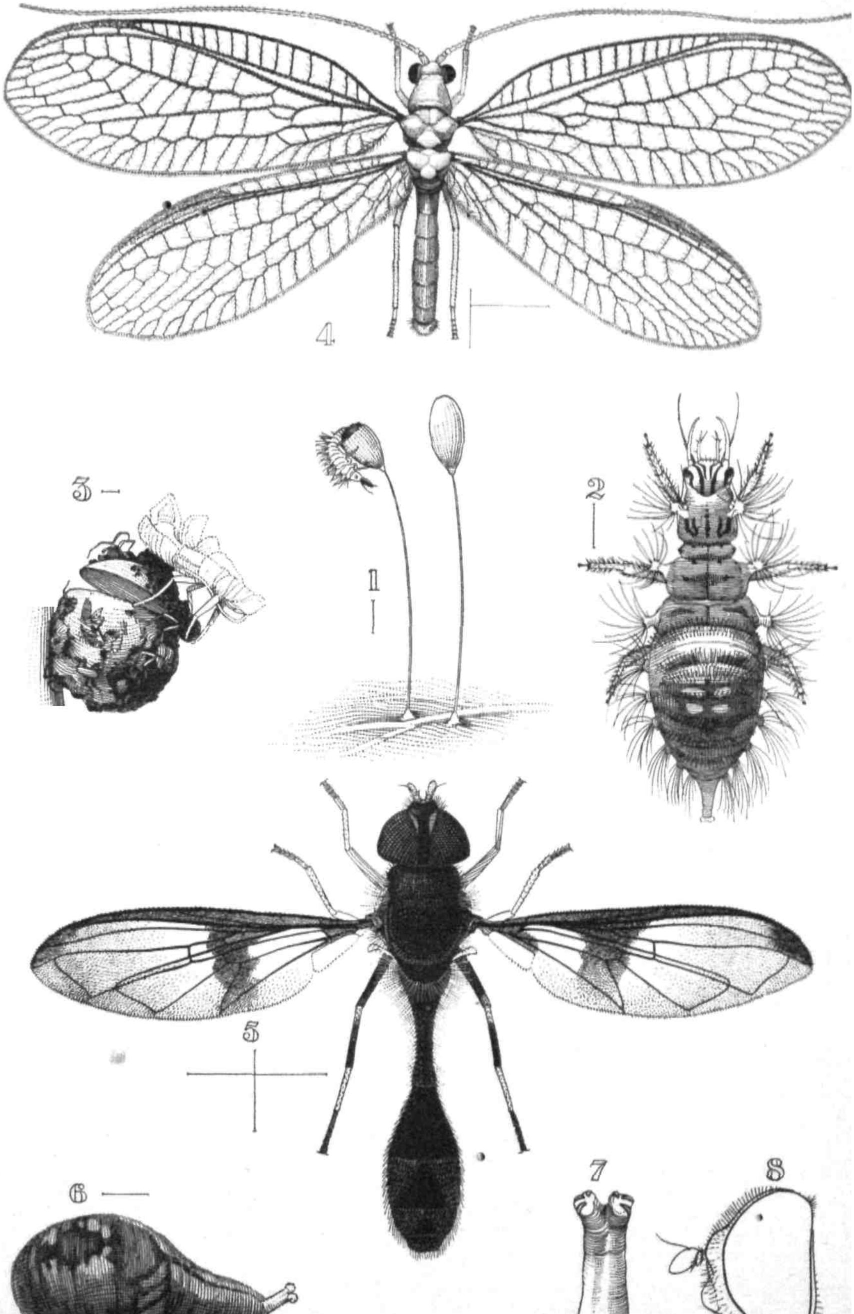

PLATE X.